Affordable Geothermally Heated Roadway System Concept

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Introduction

Imagine a world where during the colder months, salting and plowing roads never needs to happen in order to keep roads free of snow and ice. If such a thing were within practical reach, it would mean a savings of billions of dollars in road repairs (no freezing means no potholes,) costs associated with automobile accidents, medical bills and would mean saving thousands of lives. As it turns out, such a world may be within reach.

Abstract

A geothermally heated roadway would be composed of traditional asphalt sitting atop a thermally conductive metal plate (in actuality, a series of interconnected plates) covering the road surface. The plates would be thermally insulating on the bottom (which would otherwise be bleeding heat into the colder top soil) and would be perforated to make room for a series of specialized steel pyles that would bore (at first) six feet into the ground and subsequently up to 10 feet down through a specialized, cost-effective mechanism.

At these depths, the soil temperature holds at roughly 55 degrees Fahrenheit year-round, heat energy that can be pumped into asphalt to obviate the need for road treatments that fail to prevent damage to roads associated with the repeated expansion of liquid water during freezing. With this annual insult to the paved surface eliminated, a roadway could be used with little maintenance for a decade or more at a time -- about three times as durable as current roads in areas that deal with snowfall and icing.

What makes this possible will be a series of thin steel cables within the larger sheath of the pyle. After a pneumatic pyle driver pushes the overall pyle mechanism most of the way to its intended depth, a cap is then removed, exposing individual fibers. The fibers, unlike those on a steel support cable, would be individual and not interweaved. They would, however, have riflings on the outside, which would serve three distinct purposes.

The first would be for making it so that fibers to be injected deeper into the soil in the center will more readily slide against one another than those approaching the periphery. In other words, a telescoping effect would be desirable in which layers of fibers would maintain contact with one another near the sheath. The fibers in the center would have rifling grooves that are more shallow than those grooves on the fibers near the edges. All of the fibers would be lubricated with liquid silicon solution with the broadness and depth of the riflings determining how quickly the steel tendrils are injected into the earth. A series of angled perforations at the bottom of the pyle sheath would provide initial guidance toward the end of making sure each fiber starts off on a slightly different path. Random fluctuations in soil consistency would cause

the fibers to deviate in their path somewhat further; something generally desirable for our purposes.

The second reason for them is to help the fibers to make their way through the soil, broadly moving downward but tending to randomly deviate in the soil like a cross between a string and a drill bit, forming ultimately a pattern similar to an astrocyte.

The third reason is to maximize the surface area of the tendrils so as to be ideal for heat conduction.

Prior to twisting the cap back on, the vacancy in the sheath is back-filled halfway with wet mud (cheaper and more heat conductive than concrete) to fill in the spaces between fibers and the air space left by injecting the fibers. The sheaths are filled only halfway since conduction with the cold soil-bordering segment is undesirable. It may even be desirable (if adding to the cost only slightly) to partially remove through a reverse pneumatic mechanism as much of the air in the sheath as possible and to have the sheaths capped automatically by the same nozzle that attaches to remove the air. In this way, the heat flow essentially moves in just one direction.

A final pulse applied to the overall pyle after it is capped pushes it to the proper placement relative to the plate, making it flush with the surface.

The upper few feet of the sheath would be insulated on the outside, preventing heat exchange with the cold top soil.

A pyle in the center of each lane of road placed at an interval of one every eight feet would be sufficient to maintain a safe road surface temperature automatically and without electrical input. Under the most extreme wind chill factors, snow may accumulate on a road with such a geothermal system temporarily, but the damage to asphault associated with water freezing would still be largely mitigated. These systems would be ideal in areas that deal with snowfall annually but may not be sufficient in truly arctic climes where snow is already addressed through the use of tire chains or tractored vehicles.

Conclusion

Significant pushback can be expected from construction companies (sc. unions) and the corrupt politicians who are bribed to maintain the current system of graft. Intervention by Congress may even be necessary in some venues to assure that the most durable possible method of road construction is utilized. Such systems could, of course, be proven in concept as driveway heating systems before larger road projects are initiated. This design would furthermore have significant financial value if protected by patent and thus there is a financial incentive for its development.